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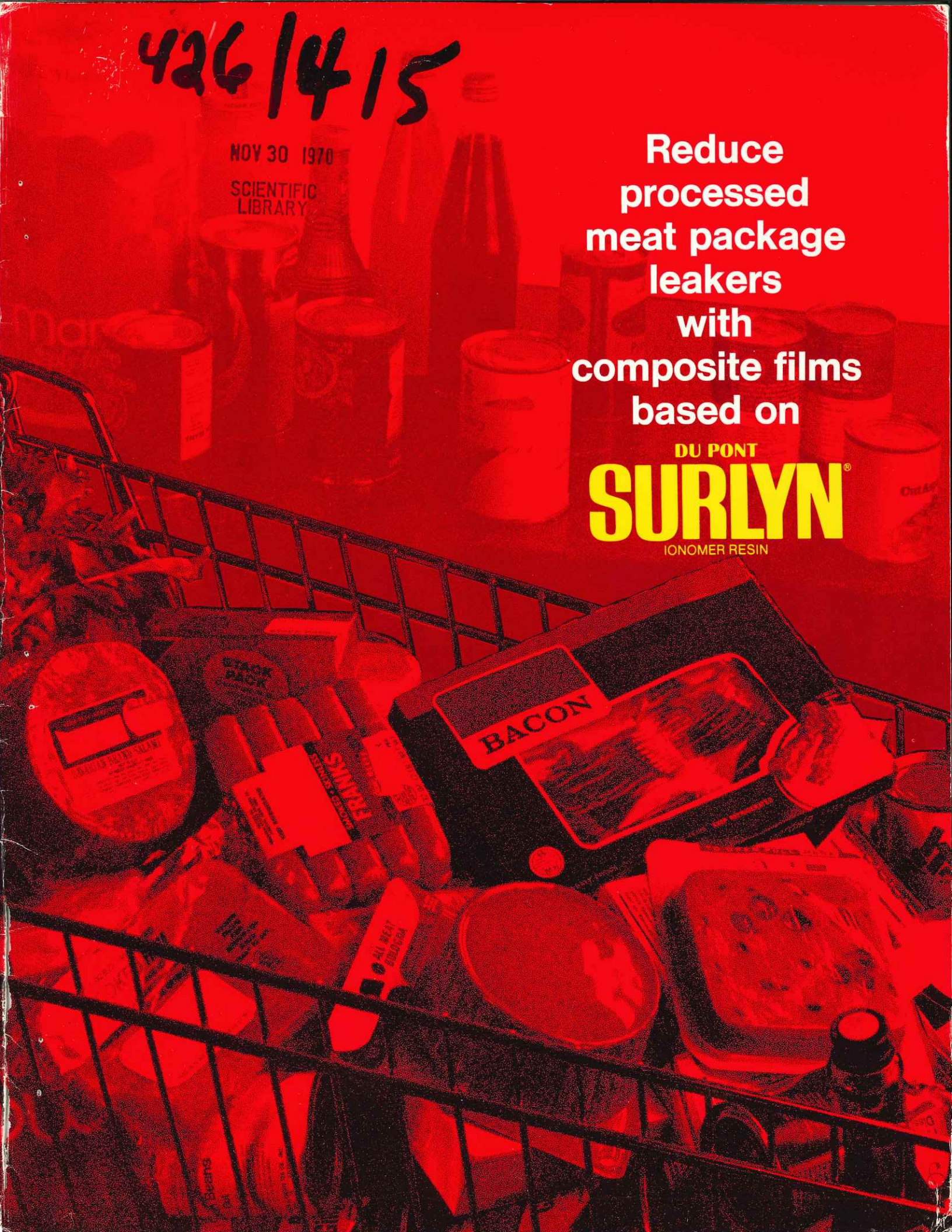
Reduce processed meat package leakers with composite films based on

DU PONT

SURLYN®

IONOMER RESIN



Improved packaging performance with SURLYN

In recent years, leading processed meat packers have looked for new ways to make their business more profitable. One avenue is through improved packaging performance. Development work throughout the packaging industry has led to a high degree of sophistication of packaging systems and refinement of the conventional vacuum package for processed meats. A new family of packaging materials which has proved successful in packing plants and in the marketplace involves composite films based on Du Pont's SURLYN ionomer resin.

The value-in-use demonstrated by these new structures, with resultant cost savings, is brought about by:

1. Reduction of leakers in plant and at the retail level.
2. Improved machinability.
3. Better package appearance.

This booklet explains the properties and characteristics of SURLYN which are pertinent to processed meat packaging. The data presented is complemented by case histories of the experiences of progressive national and regional packers who are using composite films based on SURLYN.

Frankfurters packaged in composite films based on polyethylene.

Improved profitability with SURLYN

Composite films based on SURLYN ionomer resin are often premium priced, when compared to polyethylene-based composites. However, in applications where high rates of leaking packages have shown a need for package improvement, composites with SURLYN have demonstrated improved performance and cost savings which more than offset the premium price.

Significant property advantages of SURLYN which help reduce leakers and contribute to higher profitability are:

- More reliable heat seals
- Greater impact strength
- Superior resistance to cracking from flexing

These properties help reduce in-plant and on-the-shelf leakers, resulting in reduced package and product loss, plus improved relations with retailers.

And SURLYN contributes to improved profitability during the packaging cycle, because of its reliable operation under a wide range of operating conditions. The result: less down time on the packaging line.

Frankfurters packaged in composite films based on SURLYN.

In addition to the cost savings made possible by reduced leakers, improved profitability can come from increased sales.

The photos at left show frankfurters packaged on the same packaging line, and purchased from neighboring supermarkets. Both were subjected to normal abuse during distribution and in-store handling. The photos demonstrate the excellent appearance of the package with SURLYN, which makes the meat more appealing and fosters impulse buying. Demonstrated too is the tendency of polyethylene-based films to loosen during handling, a tendency which has been documented in laboratory drop tests, vibration tests, and in-store inspections.

Heat sealing characteristics of SURLYN unique for packaging films

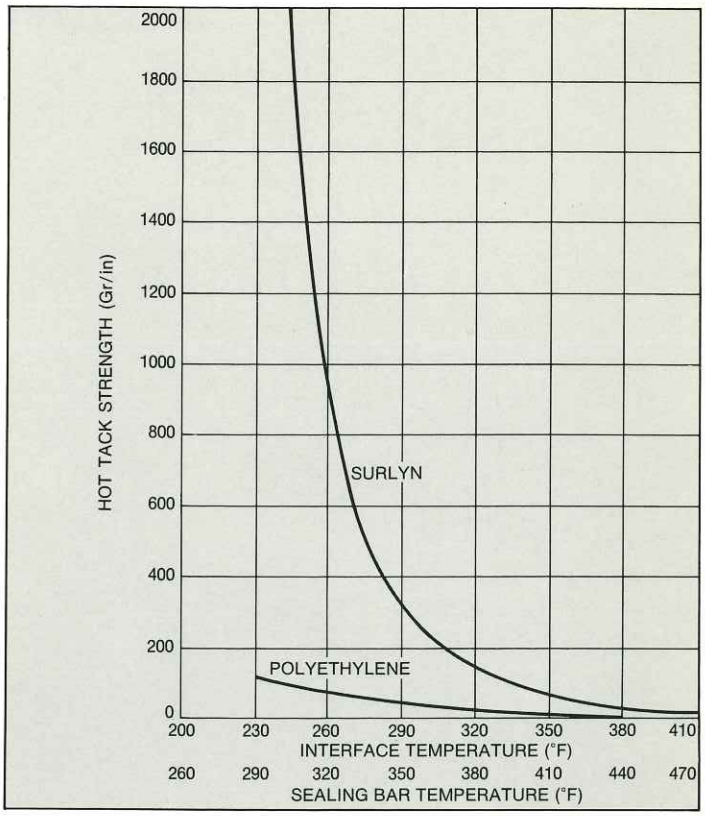
The major characteristic of composite films based on SURLYN ionomer resin is its unique heat seal properties. These properties are:

1 Hot tack strength

Immediately after being heat sealed, the innermost (heat seal) layers of composite films are still at temperatures at or above the melting point. Hot tack strength is the ability of the heat seal layers to resist separation while still molten.

The hot tack strength of SURLYN is far greater than that of polyethylene. Therefore, composite films with SURLYN have excellent seal integrity, withstand the stresses of the packaging line, and experience far fewer leakers caused by rupture of the still-cooling heat seal, than do composite films with polyethylene.

The following chart shows that the hot tack strength of SURLYN and polyethylene varies with temperature. (Temperatures shown are interface temperatures, which are approximately 60°F lower than machine settings for sealing bar temperatures.)



The high hot tack strength of SURLYN is most apparent at interface temperatures of 250° to 300°F (310° to 360°F sealing bar temperatures). At these temperatures, the hot tack strength of SURLYN ranges from about 10 to more than 20 times that of polyethylene.

The recommended heat sealing interface temperature for composite films with SURLYN is approximately 265°F (325°F sealing bar temperature). At this temperature, the following comparison between SURLYN and polyethylene is noted:

Heat seal layer	Hot tack strength
SURLYN	approx. 825 grams per inch
Polyethylene	approx. 60 grams per inch

Interface temperatures of 340°-390°F (400°-450° sealing bar temperature), which are commonly used for polyethylene, are unnecessary for SURLYN, which achieves higher hot tack strength at lower temperatures.

2 Lower Sealing Temperatures

As previously noted, composite films with SURLYN produce more reliable heat seals than polyethylene at lower temperatures. Lower temperatures also reduce the possibility of heat seals thinning out or burning through. Moreover, lower temperatures reduce the strain and subsequent maintenance on heat sealing equipment.

3 Reliable Peelable Seals

A new innovation in vacuum packaging is the peelable heat seal. Laboratory tests and commercial experience have resulted in techniques which combine special types of SURLYN with carefully controlled sealing conditions, to provide heat seals of high integrity, yet which can be easily opened. A key to this easy-open feature is the superior hot tack strength of SURLYN, which reduces the possibility of heat seal failure.

Improved packaging performance—reduced leakers—better customer relations. Lykes Food Products of Albany, Georgia, packages 12-ounce, one pound, and double cavity two-pound units of sliced luncheon meats in composite films with SURLYN. Since adopting the new flexible package, Lykes has experienced a considerable reduction in off-machine leakers, compared to polyethylene-based composites. And after 24-hour storage, the leaker rate is virtually zero. Lykes also credits the film based on SURLYN with being easier to run on its packaging lines.

Of even greater significance, one of the packer's major customers, Winn-Dixie Stores, reported a noticeable reduction in the number of leakers at the retail store level.

Tough composite films with SURLYN for deeper draws, fewer pinholes

Some packers of processed meats are using composite films with SURLYN ionomer resin not just because of the exceptional heat sealing characteristics, but also because SURLYN permits deeper draws on vacuum packaging machines, without experiencing costly ruptures in the bottom perimeter of the package.

Tests simulating the vacuum draw of a cavity mold have shown that composite films of nylon/SURLYN can be consistently drawn, without rupture, into cavities up to 50% deeper than can be drawn with equivalent gauge nylon/polyethylene films.

Other studies indicate that deep draw packages made with composite films with SURLYN, when run on conventional vacuum packaging lines, have consistently thicker corners—the critical point for ruptures—than do equivalent composites with polyethylene. The high melt strength of SURLYN permits it, and the other film layer or layers in the composite (usually nylon), to draw more evenly. Thus, the corners of the drawn cavity, when a typical composite film with SURLYN is used, are 30 per cent thicker than when equivalent gauge composites with polyethylene are used. This extra thickness gives greatly added protection against corner ruptures.

Because of this capability of composites with SURLYN to draw evenly, plus its high resistance to puncture from impact or abrasion, many packers of processed meats have found it possible to reduce total film thickness in the forming web by 10 to 20 per cent compared with nylon/polyethylene composite films, *without sacrificing package integrity*. Other benefits are that thinner gauges experience less wrinkling in the formed web, and provide more footage per roll of film, resulting in fewer stoppages to change rolls.

Another property of SURLYN which contributes to package integrity is its resistance to flex pinholing, especially under low temperature conditions.

Results from a standard test, the Gelbo Flex Test, support this. In this test, the films were twisted to simulate flexing of packages during shipment and handling. At 32°F, the films were twisted 45 times per minute for 15 minutes. Upon completion, the number of pinholes caused by this flexing were counted and are shown in the following chart.

Composite Film	Pinholes Per 100 Sq. In.
1 mil nylon/2 mils SURLYN	4
1 mil nylon/2 mils polyethylene	14
½ mil MYLAR/2 mils SURLYN	8
½ mil MYLAR/2 mils polyethylene	34

The chart clearly shows that the composite films with SURLYN resist flex pinholing at normal shipping and storage temperatures, to a far greater degree than do composites with polyethylene. This resistance to pinholing is especially important for packages which require long shelf life, travel great distances, or otherwise receive rough treatment or extended handling.

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Sunnyland Packing Company reduced their leaker rate on vacuum packaged sliced luncheon meats from a high that sometimes ran to 25-30%, down to a consistent ½ of 1%, by switching to composite films with SURLYN. Sunnyland includes off-machine, after-24-hour inspection, and field returns in their leaker rate.

They got the added advantages of improved appearance because of less wrinkling and greater clarity, considerably increased production due to fewer off-machine rejects, and improved retailer relations.

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Reduced leakers mean reduced costs

With all their impressive physical properties, composite films based on SURLYN ionomer resin must, in the end, reduce overall packaging costs, as well as improve package performance, to justify their premium price. There must be a *net* saving to the meat packer.

Typically, meat packers who switch to composite films with SURLYN report reduction in leaker rates of one-half or more. In most cases, this reduction is quickly translated into *net* savings, because of a decrease in product and package loss. Depending upon the cost of the package and the cost of the meat it contains, only a modest decrease in total leaker and return rates can result in the savings.

The following table shows several typical examples of net savings based on a reduction in returns from retail stores, made possible by the reduced leaker rates common with composite films with SURLYN.

SAVINGS DUE TO REDUCED RETURNS

Reduction in % of returns by switching to composite films with SURLYN	Total Cost of Meat and Package	Gross Savings per 1,000,000 packages	Typical Premium Paid for SURLYN per 1,000,000 packages	Net Savings per 1,000,000 packages
.75%	50¢ ea.	$ 3,750	$3,000	$ 750
1.0 %	53¢ ea.	$ 5,300	$2,900	$ 2,300
2.0 %	75¢ ea.	$15,000	$3,200	$11,800
3.0 %	64¢ ea.	$19,200	$3,100	$16,100
4.0 %	51¢ ea.	$20,400	$3,400	$17,000

Another potential savings is the cost of repackaging leakers discovered off-machine or after 24-hour storage. By reducing the overall leaker rate, the number of packages which require repackaging will also be reduced. This savings in repackaging cost is shown in several typical examples in the table below.

SAVINGS DUE TO LOWER RATE OF REPACKAGING

Repackaging Cost- Composite Film with Polyethylene			Repackaging Cost- Composite Film with SURLYN			Net Savings
Cost of Package & Labor*	% of Production Repackaged	Cost of Repackaging (per 1,000,000 original packages)	Cost of Package & Labor*	% of Production Repackaged	Cost of Repackaging (per 1,000,000 original packages)	in Repackaging costs (per 1,000,000 orig. packages)
4.5¢ ea.	4%	$1,800	4.9¢ ea.	2%	$ 980	$ 820
4.5¢ ea.	2%	$ 900	4.9¢ ea.	1%	$ 490	$ 410
4.5¢ ea.	6%	$2,700	4.9¢ ea.	2%	$ 980	$1,720
6.5¢ ea.	4%	$2,600	7.3¢ ea.	2%	$1,460	$1,140
7.5¢ ea.	4%	$3,000	8.5¢ ea.	2%	$1,700	$1,300

*Includes labor and fixed overhead. Difference represents premium price of composite film with SURLYN.

In each of the typical examples shown, the net savings in repackaging cost should be added to the net savings due to reduced returns, shown in the previous table. The new total represents typical potential total savings per 1,000,000 packages, which can accrue to the meat packer who switches to composite films with SURLYN.

By applying present experience, and assuming a reduction in leakers of at least one-half by switching to SURLYN, each meat packer can estimate his own potential savings. For a more accurate appraisal of cost savings, representatives of film suppliers should be consulted.

The data shown above as typical examples, and the case histories documented throughout this booklet, show how composite films with SURLYN can and have saved packaging costs in a variety of situations. The experience of each meat packer is somewhat different from all others, and to determine actual savings in a specific situation, a trial run with a minimum of 50,000 packages is recommended.

John Morrell & Company has adopted three composite structures based on SURLYN to dramatically improve their packaging performance for luncheon meats and bacon. One construction, for luncheon meats, is a semi-rigid structure with an easy-open peelable seal. The other two, adopted following the success of the semi-rigid package, are both flexible packages, used for bacon and sliced meats. In each case, Morrell has experienced a significant reduction in leakers, both off-machine and after 24-hour storage, and an equally impressive decline in returns from retail outlets. In addition, Morrell reports improved package appearance and durability and greater processing flexibility.

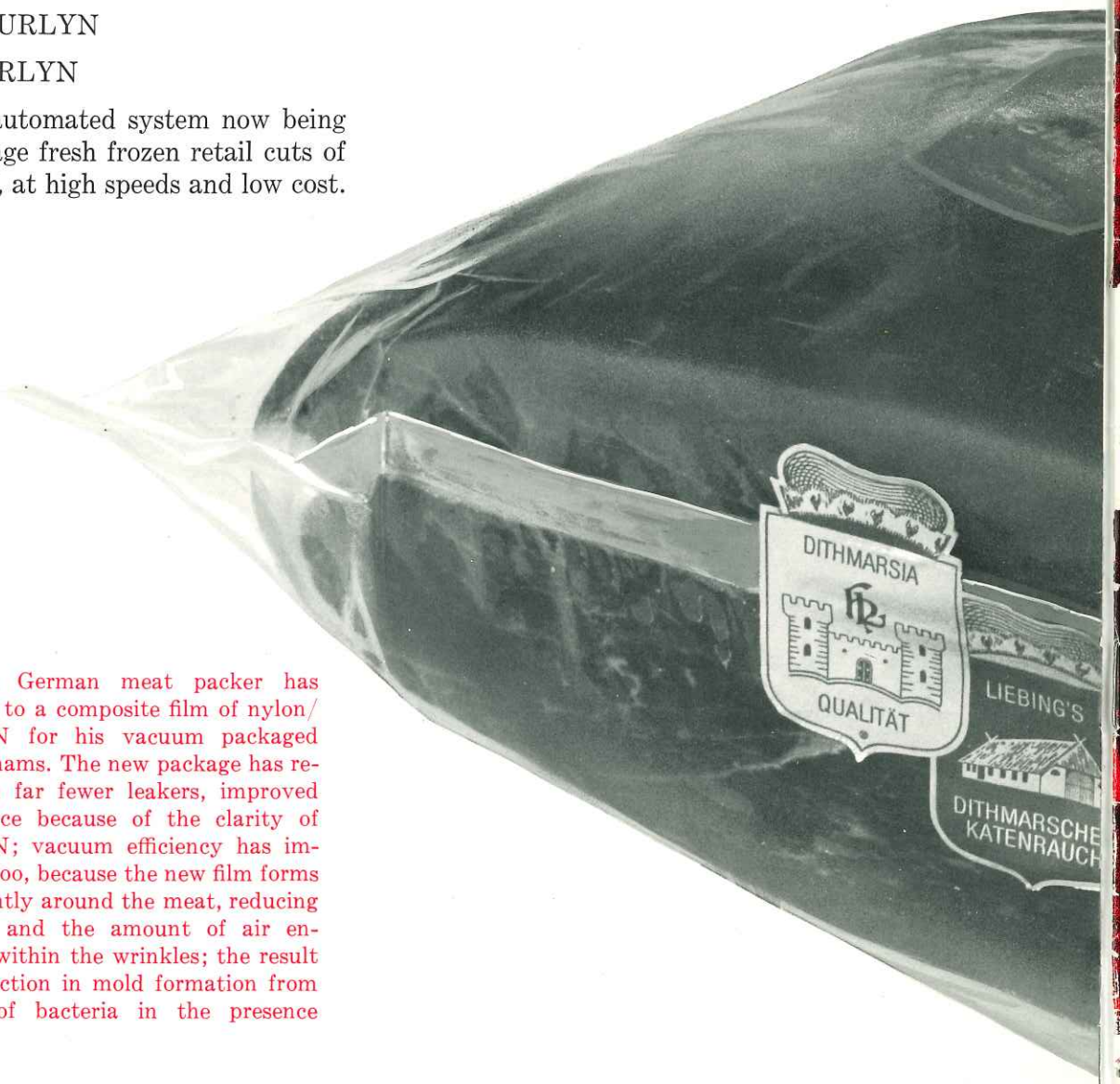
The reason for the extension of SURLYN from semi-rigid packages to both flexible units is the appreciable cost savings Morrell has enjoyed. For example, the composites based on SURLYN now used for flexible processed meat packages generate over-all savings greater than the price premium for the new structures.

A look to the future . . .

New applications for composite films with SURLYN arrive at the marketplace continually. Its wide range of versatile properties are the key to the success of SURLYN, and also stimulate packaging innovators in other industries to try SURLYN in varied applications. For example, packers of smoked ham, smoked bacon, and smoked pork are using various composite films with SURLYN to pack their products in vacuum bags. The composites include:

- Cellophane/2 mil SURLYN
- 1.6 mil nylon/2.7 mil SURLYN
- 2.4 mil nylon/3 mil SURLYN

In another example, an automated system now being developed will skin package fresh frozen retail cuts of meat in film of SURLYN, at high speeds and low cost.



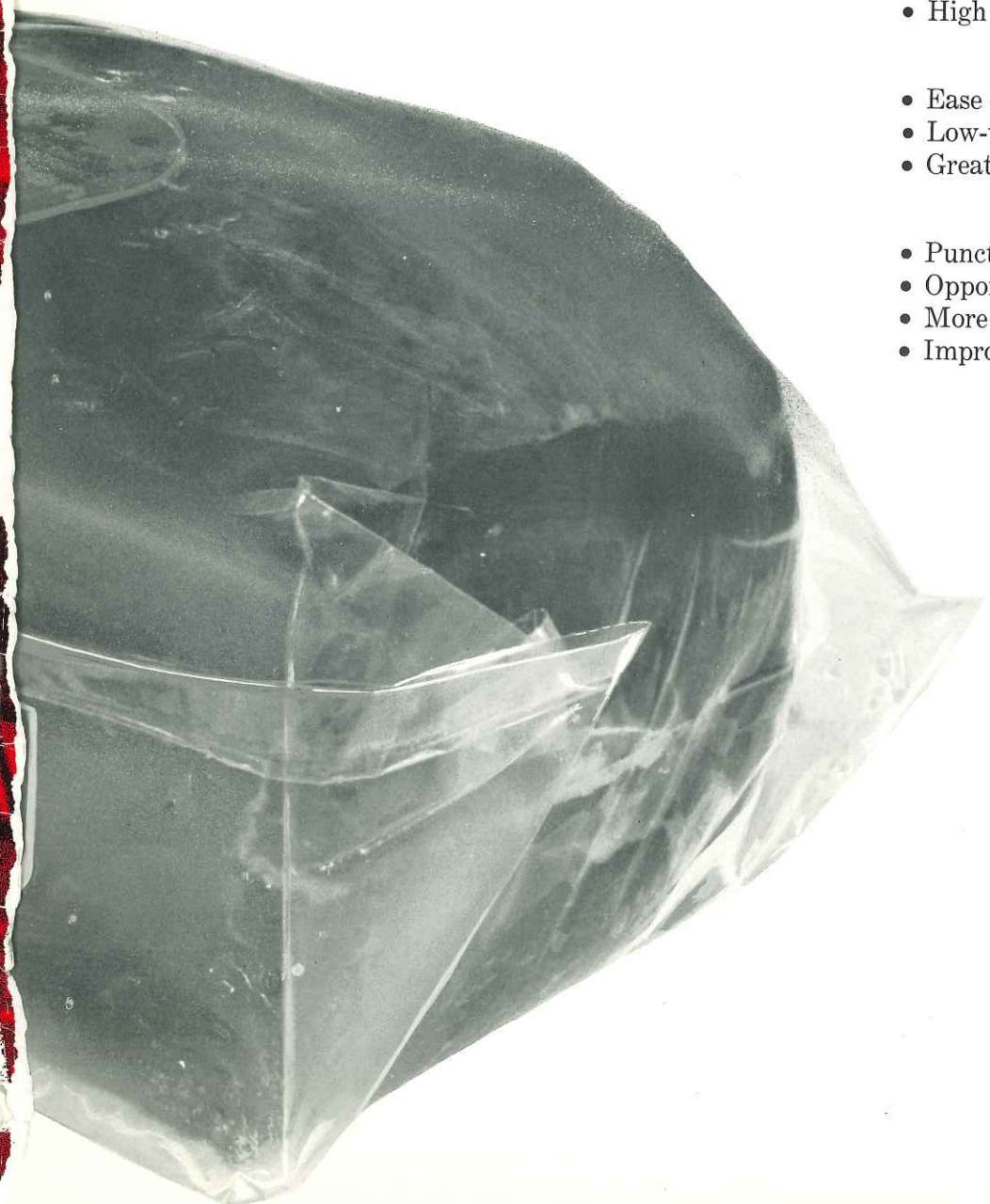
A West German meat packer has switched to a composite film of nylon/SURLYN for his vacuum packaged smoked hams. The new package has resulted in far fewer leakers, improved appearance because of the clarity of SURLYN; vacuum efficiency has improved, too, because the new film forms more tightly around the meat, reducing wrinkles and the amount of air entrapped within the wrinkles; the result is a reduction in mold formation from growth of bacteria in the presence of air.

Summary of benefits & properties of composite films with SURLYN

- Fewer film ruptures ("blow-outs")
- Reduced heat seal failures
- More reliable heat seals
- Sealing capability at lower temperatures
- Less packaging line downtime
- High hot tack strength

- Ease of forming, deep-drawing
- Low-temperature impact resistance
- Greater resistance to flex pinholing

- Puncture and abrasion resistance
- Opportunity for cost savings
- More gloss, less haze
- Improved appearance for consumer appeal



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